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ABSTRACT

Most freshmen who have been introduced to the scientific report are unaware of its rhetorical complexities and problem-solving purpose. Instead, they experience the task of writing lab reports as a perfunctory recording of prescribed activities. In 1994 an instructor, faced with the task of developing a writing across the curriculum (WAC) sequence for freshmen concurrently enrolled in Biology 101-102, devised a training tool that she called a "quasi-scientific report (QSR)" because it draws on the scientific method and report format without relying heavily on student or teacher expertise. The first application of QSR revolved around a psychological assessment tool called "cognitive style mapping." Students took a psychological test and were scored. Then, they wrote a report, including an introduction, method, results, and discussion sections, developing their own hypothesis about the psychological test. In a similar exercise, they compared a scientific report with a version of it published in a popular magazine. The pedagogical value of these exercises is significant in light of several pedagogical theories: (1) the exercises asked the students to employ the kind of critical thinking integral to scientific inquiry; (2) they help students to learn to play what Peter Elbow calls "the doubting and believing game"; and (3) the oddity and simplicity of a border genre like QSR are part of its strength. With "flimsy" science, students can easily spot flaws. And once flaws are spotted, all of science is thrown into question, and students are thus engaged in higher cognitive skills. (Contains 28 references.) (TB)

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A Hybrid Genre for Embracing WAC Contraries

by A. Wendy Loomis

Presented at CCCC, Milwaukee, WI
March 27, 1996

Writing across the curriculum (WAC) is on one hand practical composition pedagogy and on the other an adventure into the uses of written language outside the primrose paths of belles lettres.

As we start to turn the microscope on academic disciplinary writing, it will take us a while to know what we wish to concentrate on and how to get our analytic tools in focus. Now we are rightfully searching for striking details, intriguing juxtapositions, and organizing patterns.

Charles Bazerman, College English, 53.1 (1991).

Writing is a unique and contradictory act, according to Janet Emig, one which is not only technological, but "our representation of the world made visible" (124). Because writing is simultaneously enactive, iconic, and symbolic, she suggests, it offers three gateways to learning: the hand, the eye, and the brain (126). Emig's comments help articulate the value of taking writing out of the limited domain of the literature class, and using it in a range of academic contexts. Typically, writing is combined with the disciplines in one of two ways. A "Writing intensive" (WI) expects numerous written assignments from

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students, and is taught by an instructor from a department other than English. Conversely, composition classes can host content borrowed from other disciplines (McLeod 83-84). Recent research suggests that students themselves perceive benefit in WI classes. Not only did 78% of the students interviewed at the University of Hawaii report that their writing skills had improved as a result of WI classes, a significant majority (83%) found these classes helped them "understand course material better or retain course material longer (or both)" (Rodgers 71). While the "writing intensive" approach brings writing into geology, history, and other courses, the alternative approach brings disciplinary content and forms into the composition class where they can be considered from a rhetorical perspective. The value of a rhetorical lens for viewing different subjects has been argued by theorists such as Claire Jerry, who writes that "if a rhetorical epistemology were to be applied to the philosophy of other disciplines it could expand and explicate their understanding of their own activity" (125). Based on the notion that "language, learning, and teaching are inextricably linked" and continually negotiated across academic and professional planes, WAC has gained ground in American universities since the late 1970s (Russell 19, Haaverman Review 3). WAC has evolved beyond the embryonic stages, becoming so entrenched in American higher education that it is now referred to as entering its "second stage" (McLeod 79).

In this climate, a philosophical dichotomy has surfaced. Kirscht et al have identified the antagonistic positions of "writing to learn" versus "writing in the disciplines," which put writing as an informal process for mastering content

against writing as a specialized activity closely linked to the inquiry methods and conventions of a discipline (371). This "fundamental conflict" is a potentially troubling case of content versus form:

> When taken to an extreme, such prescriptive schema threaten to reduce "writing to learn," on the one hand, to "Romantic expressivism" (Faigley 5,29-31) and the solipsistic acts of an individual "isolated from the social world" (Cooper 363); and, on the other hand, to reduce "learning to write in the disciplines" to passive, even mechanical, mimesis, a politically conservative mechanism for social control, and finally, to a convention-ized commodity. (Kirscht 372)

Kirscht et al rightly argue that this is a false dichotomy, one which insists on a single valid perspective (373). Since content is woven into a form that reflects disciplinary purpose and content, they advocate use of a genre, such as the experimental report, to help students discover relativistic complexities, and arrive at greater understanding. Yet John Gage warns that if writing instruction focuses too heavily on forms and modes, we risk eradicating "the function of inquiry" (160). The weakness of the current traditional approach, in Gage's view, is that "the skill sought is the skill of making formal patterns, under the pressure of intentions of making them, rather than the skill of using them to achieve some other intention" (161). Can a formal convention offer greater insight, while avoiding the formalistic trap Gage describes?

REINVENTING THE SCIENTIFIC REPORT

In Shaping Written Knowledge, Charles Bazerman remarks that the "single genre of the experimental report runs as a common thread throughout the natural sciences of the last three centuries and the social sciences of this century" (7). Its standardized segments, or "IMRD structure" (introduction, methods, results, and discussion), correspond to the critical stance of the experimental method and its steps of positivistic reasoning (Wade 173). Although the scientific report is considered the most "rigidly prescribed" type of professional documentation, its roots are expressivist, for the scientific method is based on the Renaissance belief that "an individual can discover truths empirically through his or her own senses" (Kennedy and Montgomery 275; Harris 7). In one sense, experimental reports today are a type of advertisement for the scientist, an eristic tool designed to persuade other scientists to reach a certain conclusion about experimental data (Gross 5; Prelli 83). In a collective sense, however, scientific reports become the rhetoric "that structure and give meaning to raw sensation" (Francesconi 109). They manifest the world's body of scientific knowledge, and contribute to the loop which "is not only a means of influencing, but also a means by which we are influenced" (110).

Most freshmen who have been introduced to the scientific report are unaware of its rhetorical complexities and problem solving purpose. Instead, they experience the task of writing lab reports as a perfunctory recording of prescribed activities. Due to understandable safety and logistical reasons, novice science students are generally told what they are going to research, how

they will research it, and what they expect to find before they ever pick up a beaker or focus a microscope. As a result, scientific reports produced in lower level college courses tend to be homogeneous, formulaic shells, written with varying degrees of mechanical correctness. The full rhetorical nature of the genre is stripped away, because the writer has not been engaged in inquiry. Biology 101/102 laboratory reports generally have more in common with the transcription of cookbook recipes than with true science.

In 1994 I was faced with designing a 'WAC' composition sequence for freshmen who would be concurrently enrolled in Biology 101/102 at the Newark campus of Rutgers University. The biology department had provided me with their syllabus and textbook, but I wasn't just interested in providing students with writing assignments that served as content driven study aides. I hoped to provide them with a writing experience other than the typically lifeless lab report, one that perhaps could give them a taste of scientific inquiry. I considered having students design and propose a real experiment, which they would document in writing the "Introduction" and "Methods" sections of a scientific report. My colleague in the biology program, however, convinced me otherwise. He pointed out that it takes until the doctoral level to acquire sufficient subject knowledge to merely know how to approach experimental design in biology. Even doctoral candidates are daunted by the task. (Here I had to acknowledge that I, myself, was not quite prepared for doctoral level biology, despite three years of writing abstracts for environmental indexes.) If the freshmen were to get a taste of real scientific head scratching, we would need

another strategy. So the questions arose: Would it be possible to distill out the inquiry method, for use with applications that require less training? Could a genre be valuable with slight impurities?

Thus a rhetorical mongrel was born of the combination of using the scientific report format with "non-scientific" composition activities. To distinguish my mongrel version from the "real" disciplinary versions, I refer to this hybrid as the "quasi-scientific report" (QSR), for it draws on the scientific method without relying heavily on student (or teacher) expertise. As in a real scientific report, the QSR requires a hypothesis in the "Introduction" section, a narrative explanation of the study in "Methods," data findings in "Results," and an analysis in "Discussion." Further, group feedback and revision are built into the writing process, disguised as "professional peer review." The QSR can also include a summarizing "Abstract" section and tables for organizing the data.

I tried the QSR with two distinct activities. The first involved evaluation of a self-awareness questionnaire, and the second compared two types of biological writing.

MAKING STUDENTS THE SUBJECT OF THEIR OWN EXPERIMENT

The first application of the QSR revolved around a psychological self-assessment tool, called "Cognitive Style Mapping," which I obtained from the Rutgers Learning Resource Center. This tool is intended to reveal the ways in which an individual prefers to receive and process information. A series of 224 questions ask respondents how frequently a given statement, such as "I would

rather read a map than listen to someone give me directions," pertains to them. Responses are compiled together into the "Cognitive Style Map," a profile intended to reveal favourable and unfavourable learning situations for that individual. Presumably such insights would allow the student to compensate in classroom situations which cater to a different cognitive style. For example, a high score in the "language input by hearing" parameter would reflect an individual who absorbs information efficiently in a lecture situation. If the aurally oriented student attended a math class in which the teacher spoke little and drew problems on the chalk board, this student might find it useful to tape-record his own explanations, and then replay them while studying for the exam.

Students self administered the Cognitive Style Mapping questionnaires at home, and then a colleague from the Learning Resource Center, Patricia Bender, visited the class to explain how to "map" the results. Ms. Bender discussed the purpose and scoring of the questionnaire, and suggested implications of the CogMaps, such as how a professor's own style might impact on student performance. The entire activity was framed as an experiment, and it was the students' task to postulate a hypothesis, collect data, analyze results, and discuss the findings in their QSR. To assist with the analysis, in addition to completing the CogMaps and charting those results, students were asked to design a table that correlated their academic performance in high school with their high school teachers' pedagogical styles. Over the course of several weeks,

students wrote their "Introduction," "Methods," "Results," and "Discussion" sections, and concluded with the "Abstract."

As a preliminary step, classroom discussion distinguished between thesis and hypothesis, and considered the similarities and differences between academic essays and scientific laboratory reports. In their concern to be "professional," students asked the inevitable question, "Do we use 'I'?," which led us to focus on authorial voice. Just as Lee Odell reports how composition students are "surprised and often frustrated by the uncertainty and the sheer hard work entailed in formulating a problem clearly" (42), my students struggled to find their own hypotheses. Some assumed the veracity of the CogMap results, and chose to examine its implications in their own lives. Their "Discussion" sections centered on the usefulness of greater self awareness. A second group questioned the validity of the test itself. They used their "Discussion" sections to challenge specific items on the CogMap questionnaire, saying that the wording would cause misleading results. For example, some felt they couldn't agree or disagree with test statements such as "I can taste the difference between Coke and Pepsi Cola with my eyes closed," because they don't drink sodas. One student was so frustrated when the CogMap revealed he was not artistic or dextrous, that he composed and answered his own list of supplemental questions, and appended it to his "Results" section.

EXPERIMENTING WITH COMPARE/CONTRAST

The second activity put a positivistic twist on a rather ordinary classroom activity. Students used the QSH format to compare the biological writing found in a mass market science magazine and in a scientific research journal. After selecting an article about an animal species from Natural History magazine, students then located the author's original journal article upon which the popular media article was based. They hypothesized about the features of the two articles, based on their recognitions of audience differences between the two, and then sought ways to quantify their examinations and construct supporting tables. The class argued over whether they could obtain valid results by analyzing a single page of each article. Measurements they devised included numbers of parentheses in the text, types of verbs used, etc.. Soon they became challenged by the particularities of table design, such as the need for related percentages to total 100%, or the ability of proper data layout to facilitate subsequent analysis. During one "peer review" workshop, students got to see the tables each other had prepared, and took away ideas for expanding their own approaches. The quantitative data from their investigations led naturally to a class discussion about what the stylistic variations suggested about the rhetorical situation of each source publication.

After they had completed all the sections of their QSHs in this activity, Doug Morrison, a scientist and director of the freshman biology program, visited to discuss scientific writing with the class. He asked the students to think about those qualities of the genres which were captured through their

"experiment" and those which were not. Together they discussed how "dry" experimental reports are, because the excitement of discovery has been removed, as compared to popular media, which evokes a more human aspect of science. Morrison also shared some disciplinary realities, such as writing grant proposals for research *after* experiments have been conducted, because it is easier to write when the results are certain. Fresh from immersion in their own QSR "experiment," the class was eager to hear from a professional scientist, and one student wrote later that the visit "broadened my understanding immensely."

COGNITIVE BENEFITS

Written problem-solving in the professions reflects an "organic and multi-dimensional" process, because "the demands of definition, research, analysis, resolution and synthesis, and implementation must be met at various stages or levels of investigation" (Kennedy and Montgomery xiii). While these QSR applications may not at first glance look terribly "serious," they did in fact open meaningful windows into scientific problem-solving, and challenged students to think critically. If, as Lee Odell says, "significant improvement in writing comes only as students grow intellectually, [then] we shall have to understand and assist students with that growth" (36). To see how the QSR can help foster intellectual growth, it is useful to review the definitions of cognitive maturity.

Beyond including Piaget's formal operations, mature thought is characterized as transformative, systematic, detached, and evaluative (Neimark 44). Formal and transformative thought uses symbols, and examines the

relationships between them (49). Mature thinking is systematic, in that it seeks organization and coherence. Systematic thought allows for problem-finding, the anticipation of problems, which differs from the more concrete problem-solving in formal operations (51). Detachment is the ability to disengage from immediate context, emotion, values, and thought processes, in order to think relativistically and metacognitively. Further, mature thought is evaluative, and can appraise an idea objectively and critically based on "an explicit, coherent value system," formation of which is an on going task of adulthood (51-56). The QSR activities described above fostered many of these skills, particularly in the areas of problem-finding, critical thinking, metacognition, and offering multiple perspectives. These skills are fundamental to rhetorical invention.

INVENTION, PROBLEM-FINDING, AND CRITICAL THINKING

Theorists assert the relevance of rhetoric in the shifting sands of science, where once factual "discoveries" can be overturned in a paradigm shift. Thus Alan Gross makes the provocative statement that "from the rhetorical point of view, scientific discovery is properly described as invention" (7). Composition researchers Linda Flower and John R. Hayes, point out that invention hinges on "formulating critical questions" (22). To them the pivotal activity of writing is "problem finding: the ability to envision, pose, formulate, or create a new problematic situation," and then to follow up by "energetically exploring the entire problem" (31). Problem-finding, in rhetorical terms, is *stasis*. It is identification of key issues and establishment of a position for addressing them.

illustrates allows a writer to determine pertinent content and where objections are likely to arise (Perelli 45-46). Flower and Hayes might take issue with the term "discovery" for invention in the scientific context, as they have in the composition context, arguing instead that writing helps define meaning. Nonetheless, the *QMR* shoots right to the center of invention, because it offers both scientific "discovery" and problem-finding.

It is impossible to construct a scientific report of any type without locating a problem, for the entire IMRD format hinges on a hypothesis that is announced in the "Introduction" section. A hypothesis, of course, is a tentative solution to a problem, tested and explored in an experiment, and then documented in the scientific report. Unlike the typical biology lab report, the *QMR* offers no predetermined hypothesis or experimental strategy. Students are compelled to "invent" how to investigate their problems, and to analyze the data logically to see how it reflects on the problems they have located.

Although Cognitive Style Mapping is not a highly controlled or sophisticated instrument, nor does this activity focus on biology, per se, in the context of a *QMR* activity it does let students begin to wrestle with the scientific method. Students are largely unfamiliar with how scientific "facts" arrive in their textbooks, and the *QMR* forces allows them to simultaneously craft their own experiment (after a fashion) while on a secondary level assess someone else's "experiment" -- the "Cognitive Style Map."

When my students spontaneously questioned the design and methods of the Cognitive Style Mapping, they displayed the critical thought that lies at the

heart of scientific inquiry itself. By rebutting the validity of specific questions in the assessment tool they (1) focused on words and implicitly acknowledged the importance of rhetoric, and (2) acknowledged that the way data is collected can be as important as the data itself. Likewise, when one student objected to the compare/contrast activity because it lacked a mean, or control data set, he was expressing a concern with good experimental design. He concluded in his QRW "Discussion" section that "due to the individuality of the works in questions, the data that has been collected is purely subjective." He was, of course, scientifically speaking, right. This is ersatz science.[2] But its fruits are the rhetorical and positivistic insights described above, which are unlikely to have surfaced in Biology 101 class.

The CogMap QRW assignment in particular has intriguing benefits for working with freshmen. It allows students to "research" themselves during that difficult period of transition into college life. Making them the subject of their own experiments forced the students to try, perhaps for the first time, to perceive themselves in a detached manner, and see themselves as operating within a shifting academic context. Yet they can't be completely detached, for they care a great deal about the subject of their experiment. They become motivated to struggle metacognitively with being both inside and outside of the same "problem."

The sequenced approach of the scientific report genre transforms the QRW into a loose heuristic, giving direction to the students' thoughts. This format makes their mission in the writing assignments quite clear: to define a

problem, and approach it positivistically. It also asks students to approach an argument inductively, rather than deductively. Theoretical papers, such as academic essays, tend to assert a series of deductions supported by confirming examples. The scientific report, by contrast, reveals an inductive process in which a series of observations lead to a general statement (Gross 85). For many, this is new experience, and stimulates a depth of reflection which the familiar academic essay would not. One young woman later reflected:

> The assignment made me realize the depth one could go into, trying to investigate a subject. The superficial (obvious) is too easy. . . . When following through the scientific process, one must examine the subject from all different angles.

These are the stirrings of academic understanding, of shifting perspectives, of cognitive growth. By presenting alternative paradigms for research, and opening up methods of inquiry, we help students distinguish between disciplinary contexts and evaluate forms "based on their appropriateness to various human goals" (Hasseches 42). We begin to bridge the WAC dichotomy.

DIALECTICAL CONTRARIES

Developmental researcher Michael Hasseches has identified *dialectical thinking* as an advanced stage in cognitive maturity, which surfaces during the later adolescent and adult years, beyond Piaget's formal operations (24). As its name suggests, an individual at this stage employs a rhetorical, Hegelian type of dialectic to investigate a thesis and an antithesis, arriving at "truth" via a

concluding synthesis (Dialectic 383). Developmentally speaking, the mind experiences disequilibrium when contradictions have been identified within existing systems, and forges a new, more inclusive system to encompass them (Rauschenberg 39). The QSR is ripe with opportunities for dialectic. This quasi-genre can embrace the contraries of doubting and believing, product and process, form and content.

Peter Elbow remarks in the appendix essay of Writing Without Teachers that there are two opposing intellectual stances which people tend to adopt. One he calls "the believing game," which is a flexible willingness for exploration. The other, "the doubting game," is a posture typical of aggressive skepticism. Elbow finds that our society generally relies too heavily on the "doubting game," and overlooks much of the value which can be gained from the contrary. Ultimately, he feels, that to play either "game" well requires proficiency with its converse, for they are two sides of a single coin. In rhetorical or developmental terms, the potential for embracing two sides of a contrary offers dialectic.

Science as a current discipline is notably defined by its doubting approach, of not believing something until it has been confirmed and reconfirmed. Elbow says "some scientists talk as though they never really believe anything at all, but merely act as though certain things were true if they haven't been disproved" (150). Yet beginning level science students are not generally encouraged to doubt, but rather are plied with textbook truths delivered by professors and staged laboratory forays. In that context, science is static and the lab report format may appear little more than a curious

convention. The QSR activity of Cognitive Style Mapping described here, by contrast, gives students the opportunity to play both "games" described by Elbow, and to experience the lab report format as an opportunity to express that play. The QSRs became vehicles for the students to express their own individual views, whether they accept the classroom "experiments" docilely or with intellectual indignation. They can choose to be entirely accepting, or entirely skeptical of cognitive mapping, or they can step into the territory of dialectic, straddling both belief and doubt, allow these to coexist, as hinted at in this "Dear Graham" excerpt:

> The results obtained from this experiment should be challenged by [the subject] . . . but not necessarily be accepted as right or wrong. If a person is really not sure about him/herself, then cognitive style mapping may be an alternative to "finding" themselves.

There is no course which gives a grade for writing that does not, to a certain degree, treat a written document as a product. Even in portfolio based classes, where a document may be revised repeatedly, there is a moment at which the revisions stop, and an assessment is made. This "product" orientation is part of the territory. Yet as teachers of a rich, responsible composition instructors must address the complicated process by which a skillfully written product is created. A study at the University of Texas, however, reveals that a large proportion of WAC instructors ignore opportunities to incorporate process approach practices into their courses. Out of the *37* WAC

courses in natural sciences and engineering that were studied, a full 12 did not use any process activity at all (Braine). The QSR is uniquely positioned to include process, and particularly invention, in its pedagogy, because it revolves around an activity. With the QSR, writing becomes a voyage of thinking and discovery, which proceeds in stages as students conduct their "research" and evaluate each other's findings through "peer review."

Although the QSR gives context to simple formulistic writing activities allowing "narrative," "description," or "analysis" assignments to become purposeful "Methods," "Results," and "Discussion" segments), it is the process orientation that lifts the QSR out of the pervasive WAC form-versus-content dispute. Students who are deeply involved in designing and writing about an experiment are better positioned to appreciate the purpose, context, and assumptions of scientific writing. As Kirscht et al point out, the formal conventions of the IMRD genre help lead students to stumble over the intellectual processes upon which those same conventions were built. Restoring the genre to its true purpose of inquiry ignites valuable "periods of confusion" (378), not by dwelling on linguistic forms in isolation, but rather by focusing on the ultimate purpose of these formal conventions. These periods of confusion can give way to resolution and conceptualization at a higher level, stimulating "the ability to take multiple perspectives, to integrate and synthesize, to exercise a self conscious control over the forms of inquiry" (Kirscht 374). The QSR offers the dialectical recognition that form and content meet at disciplinary purpose and content.

In an exit survey, one student reflected on the difference between the introductory biology class and our class, where lab reports were used in differing capacities:

> Everything in Biology 101/102 is dictated to us. The experiments require little outside knowledge and almost no thought. This class . . . required an open mind and patience, because everything in this class was not get-cut and meant to fall into place with the ease it did in Bio 101/102. Messing up was three quarters the fun.

This quote speaks to what may have been the greatest success of these activities, the intellectual wrestling that went on, as the class sought to meet each assignment while challenging its methodology and. Using this formalistic text as a springboard, some students take critical thinking to self conscious and dialectical levels, while others are simply challenged to tackle a problem positivistically for the first time. As Jules Gage might put it, the benefit of the QSR is that it brings "the uncertainties and necessities of inquiry . . . into the open" (169).

BENEFITS OF A MONGREL GENRE

What is a genre? According to Berkenkotter and Huckin, it is a rhetorical form that is dynamic, both reflecting and defining social structures (478). It is a type of writing that develops in response to "recurrent situations and serve[s] to stabilize experience and give it coherence and meaning" (478). The genre of the scientific report is today considered a cornerstone of professional science, even

though it evolved relatively recently in the context of world history, as Hawhee notes. Scientific reports are "truth-seeking," disciplinary discourses "designed to bestow a sense of certainty upon conclusions" (Kinneavy 139). Even though genres, like paradigms, can eventually shift for new understandings or exigencies, members of a discipline stand firm in their current paradigm and its stabilizing genre. To share knowledge among delineated disciplines requires what Debra Journet calls "boundary rhetoric" (532). Boundary rhetoric only succeeds if the writer is able to connect with diverse genre norms, if he "can translate the *ethos* as well as the *logos* of one discipline to another" (534).

A mongrel such as the QMH, as boundary rhetoric, is in a precarious position. It borrows some of the norms of science and some from composition. Richard Larson, in the context of his position against the genre "research paper," takes issue with non-disciplinary rhetoric (814-815). He argues that a genre is contrived, and we are fooling ourselves if we appropriate a form like the scientific report for use in a composition classroom. He concludes that only disciplinary experts can properly use a genre, and solving one results in the worst of rhetorical sins: the *non form*. I would agree that we shouldn't fool ourselves, yet if we seek benefits in the composition classroom, then we should be free to choose the best tools available, consciously. If we choose a mongrel genre because it is uniquely positioned to stimulate cognitive growth and push students toward a "purer" genre, and we acknowledge this choice with our students, we are doing precisely our job as rhetorical navigators.

Michael Hanson has pointed out that to foster cognitive growth, teachers as well as students must search dynamically for the truth. He asserts that "each instance of conflicting points of view must be presented to students as an epistemological challenge – a challenge not only to the student but to the faculty as well" (42). This is reminiscent of Paulo Freire, who advocates a "problem posing education" where "the teacher presents the material to the students for their consideration, and re-considers his earlier considerations as the students express their own" (qtd. 69). The best writing classrooms have a shared consciousness about rhetorical forces and functions.

I envision a range of simple experiments beyond the two discussed here, with varying degrees of "scientificness," that would let our students benefit from the thinking heuristic provided by the QMC. The specific application only requires creativity and fortitude on the part of the instructor. David Hamilton, for example, offers useful ideas for similar "science paradox" of science, such as measuring the wind, or studying traffic patterns (787). Although the QMC lends itself to an introductory WAC setting, it may offer interesting opportunities for a wider freshman composition setting. The primary limitation is our preconceived notions about disciplinary genres.

Oddly, the simplicity and weaknesses of the emergent QMC experiments described here are part of their strength. With flimsy science, students can easily spot flaws. Once flaws are spotted, all of science is thrown into question, and students are engaging in higher cognitive skills. I wonder if a more ambitious use of the scientific report, such as the activity described by Kirsch

et al which has students design and conduct a full scale social experiment from scratch, could make a critical stance toward science quite so available. The risk with an activity such as the "empirical study report" is that students, like many scientists, become invested in their own methodology, and may lose a larger perspective. An experiment *about an experiment*, such as the Cognitive Style Mapping, both immerses and distances the writer. Once students adopt a more critical stance, they begin to have the detachment necessary to experience scientific textbook truths as a collection of socially adopted perspectives, per Thomas Kuhn's shifting paradigms. They have witnessed that scientific findings, based on human experimentation and methodology, can be flawed. The "seamless" science in their textbooks may in fact be based on a process of critical inquiry very much similar to their own experiences. A flimsy CogMap experiment or a small data set in a Compare/Contrast experiment invites students to question, and once we have questioning, we touch the center of rhetorical invention.

NOTES

1. I was interested to note David Hamilton's acknowledgment of a not uncommon problem in WAC, of the "instructor's simple inability to be everywhere an expert" (782).

2. If I teach this particular assignment again, we might identify this weakness of a small data set, and then collaboratively correct it by combining all the students' findings.

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